1922

Lead

Harry Bridgman Pulsifer

LEAD

By H. B. Pulsifer

The mine and smelter output of lead in the United States in 1921 each fell off about 20 per cent., according to the statement by C. E. Siebenthal and A. Stoll, of the United States Geological Survey, compiled from reports and estimates by producers and others. Data for the Western States are taken from the advance statements issued by the Geological Survey's western offices.

Mine Production of Lead.—The output of soft lead by mines of the Mississippi Valley was about 231,000 short tons, and that of argentiferous lead by mines of the Western States was about 170,000 tons, a total of 401,000 tons. The corresponding figures for 1920 are 251,816 tons from the Mississippi Valley (including the small output of the Eastern States) and 259,070 tons from the Western States, a total of 512,865 tons. The southeastern Missouri district made the largest output and was the only district to make a gain. Its output was 178,000 tons, as compared with 161,258 tons in 1920. The Coeur d'Alene district of Idaho came next, with about 96,000 tons, as against 118,105 tons in 1920. Utah made an output of about 45,000 tons, a decrease from 70,419 tons in 1920.

METALLURGICAL PRODUCTION OF LEAD IN THE UNITED STATES (*a*)

(Refinery statistics. In tons of 2000 lb.)

Year.	Domestic Origin.					Foreign Origin.		Grand Total.
	Desilverized.	Antimonial.	S. E. Mo.	S. W. Mo.	Total.	Desilverized.	Antimonial.	
1914.....	318,697	17,177	177,413	25,448	538,735	28,475	1,119	568,329
1915.....	305,160	24,601	185,849	20,312	535,922	43,301	2,883	582,106
1916.....	330,189	22,819	206,105	33,128	592,241	17,832	3,304	613,377
1917.....	319,015	16,265	205,861	40,575	581,716	50,962	2,991	635,669
1918.....	284,733	18,658	189,207	63,635	556,233	98,596	2,083	656,912
1919.....	226,085	14,864	158,182	55,790	454,921	61,380	1,547	517,848
1920.....	236,912	8,992	206,836	29,004	471,744	51,700	2,197	525,641
1921.....	202,649	5,419	142,304	56,155	406,896	47,697	2,361	456,954

(*a*) From *Eng. Min. Jour.*

PRODUCTION OF REFINED PRIMARY LEAD IN THE UNITED STATES (*a*)
(In short tons)

	1917.	1918.	1919.	1920.	1921.
Domestic desilverized lead	303,679	282,024	208,751	220,327	187,962
Domestic soft lead	188,503	210,463	147,744	189,854	157,513
Domestic desilverized soft lead	56,268	47,418	67,938	66,668	52,747
	548,450	539,905	424,433	476,849	398,222
Foreign desilverized lead	62,319	100,290	57,787	52,808	50,367
Total refined primary lead	610,769	640,195	482,220	529,657	448,589
Production of antimonial lead	18,646	18,570	13,874	12,535	10,064

(*a*) U. S. Geol. Surv.

APPARENT CONSUMPTION OF REFINED PRIMARY LEAD IN THE UNITED STATES, REFINERY STOCKS DISREGARDED (*a*)
(In short tons)

	1917.	1918.	1919.	1920.	1921.
Supply:					
Stock in bonded warehouses, Jan. 1	535	2,685	472	234	1,322
Imports of pigs, bars, and old	5,793	5,240	5,107	35,719	31,301
Production	610,679	640,195	482,220	529,657	448,589
	617,007	648,120	487,799	565,610	481,212
Withdrawn:					
Exports of foreign lead—					
From warehouse	37,652	59,416	40,976	17,363	25,000
In manufactures, with benefit of drawback	7,537	3,426	1,936	6,175	9,369
Exports of domestic lead	53,688	41,831	10,510	2,730	1,624
Stock in bonded warehouses, Dec. 31	2,685	472	234	1,322	347
	101,562	105,145	53,656	27,590	36,340
Apparent consumption	515,445	542,975	434,143	538,020	444,872
Lead content of ore and bullion remaining in warehouse, Dec. 31 (*b*)	23,977	16,999	45,476	51,220	19,186

(*a*) U. S. Geol. Surv.
(*b*) Some part of this may have been smelted and thus included in the quantities given above as "Foreign desilverized lead."

Refinery Production of Lead.—The output of primary domestic desilverized lead in 1921 was 187,962 short tons, of soft lead 157,513 tons, and of desilverized soft lead 52,747 tons, making a total output from domestic ores of 398,222 tons of refined lead, as compared with 476,849 tons in 1920, which was made up of 220,327 tons of desilverized lead, 189,854 tons of soft lead, and 66,668 tons of desilverized soft lead. The output of lead smelted and refined from foreign ore and bullion was 50,367 tons, as compared with 52,808 tons in 1920. The total lead smelted or refined in the United States was thus 448,589 tons, as compared with 529,657 tons in 1920. The output of antimonial lead was about 10,064 tons, as against 12,535 tons in 1920.[1]

[1] Figures of the U. S. Geol. Surv. The figures compiled by *Eng. Min. Jour.* are also shown in an accompanying table, the difference being small.

AMERICAN SILVER-LEAD SMELTING WORKS

Company.	Place.	Furnaces.	
		No.	Annual Capacity.
American Smelting & Refining Co	Denver, Col	.....	.....
American Smelting & Refining Co	Durango, Col	3	200,000
American Smelting & Refining Co	East Helena, Mont	4	330,000
American Smelting & Refining Co	El Paso, Tex	4	275,000
American Smelting & Refining Co	Leadville, Col	8	510,000
American Smelting & Refining Co	Murray, Utah	8	700,000
American Smelting & Refining Co	Omaha, Neb	2	82,000
American Smelting & Refining Co	Perth Amboy, N. J	4	170,000
American Smelting & Refining Co	Pueblo, Col	7	380,000
American Smelting & Refining Co	Selby, Cal	3	210,000
Anaconda Copper Mining Co	Great Falls, Mont	1	90,000
Bullshead Mining & Smelting Co. (*c*)	Spruce Mtn., Nev., P. O. Reno	1	11,000
Bunker Hill & Sullivan M. & C. Co	Kellogg, Idaho	4	400,000
International Smelting Co. (*a*)	Tooele, Utah	5	600,000
Northport Smelting & Refining Co. (*c*)	Northport, Wash	3	265,000
Ohio & Colorado Smelting & Refining Co. (*c*)	Salida, Col	4	360,000
Pennsylvania Smelting Co	Carnegie, Pa	2	60,000
U. S. Smelting, Ref. & Mng. Co	Midvale, Utah	7	530,000
Totals, United States		70	5,173,000
American Smelting & Refining Co	Aguascalientes	2	90,000
American Smelting & Refining Co	Chihuahua	7	500,000
American Smelting & Refining Co	Monterrey, N. L	3	220,000
American Smelting & Refining Co	Velardena	3	150,000
Mazapil Copper Co	Saltillo, Coah	3	105,000
Cia. Metalurgica Mexicana	San Luis Potosi	10	360,000
Cia. de Minerales de Peñoles (*b*)	Cerralvo, N. L	2	38,000
Cia. de Minerales de Peñoles (*c*)	Monterrey, N. L	4	250,000
Cia. Minera de Peñoles (*e*)	Mapimi, Dur	(*f*)	(*f*)
Cia. Metalurgica de Torreone (*e*)	Torreon, Coah	4	200,000
Reforma Mining & Milling Co	Campo Morado, Gro	2	21,000
Totals, Mexico		40	1,934,000
Consolidated Mining & Smelting Co	Trail, B. C	4	220,000

(*a*) Idle latter part of 1921. (*b*) Not in operation since Jan. 23, 1917. (*c*) Not in operation in 1920 and 1921. (*e*) Subsidiary of Cia. de Minerales de Peñoles. (*f*) Dismantled.

Market and Consumption.[1]—The year 1921 was probably the most unprofitable year for the lead miner since 1897. The average price for the last 25 years, f.o.b. cars New York, was 5 cts. per lb., as compared with 4.54 cts. for 1921. The price of lead in New York during December, 1920, was lower than in any month since October, 1915. Lead as a commodity has been liquidated. In four months, the price dropped from 8.90 to 4.50 cts. per lb., while the number of pounds of lead that could be produced for $1 on Jan. 1, 1921, was probably less than at any time in the history of lead mining in the United States. The cost of transportation in 1921 constituted a large part of the 4.54 cts. per lb. received for lead in New York. As an example, before the war it cost $100 to move a car of pig lead from East St. Louis to New York. In 1921. until Dec. 10, it cost slightly more than $330. Freight-rates on smelter products were advanced out of proportion to most of the other commodity rates.

[1] Irwin H. Cornell, *Eng. Min. Jour.*, Jan. 21, 1922.

The pounds of lead produced for $1 should certainly increase to a limited extent in 1922, but the average price will have to be greater than 4.50 cts. New York to bring out a production of more than 400,000 tons from American mines. The price, although affected largely by the cost, must depend on, first, the tariff; second, on the consumption; and, third, on the visible and invisible stocks. The production will depend on the price.

A curve of price and production under the different tariff laws would prove without doubt that the Underwood tariff, except through extraordinary world conditions, would keep the price of lead below the point where the metal could be economically produced in this country under the present standard of wages and living conditions.

No accurate statistics concerning the consumption of lead in the United States by industries have been collected except by the United States Government agencies during the war, and these were never published. The consumption of lead must vary directly with the general business prosperity of the country, but by approaching each important industry separately, it is possible, from present conditions, to form some opinion concerning the probable demand for the metal in 1922. The most important question is whether the use of lead in the arts is decreasing or increasing. No substitute has replaced lead in any of the important industries in the United States, nor can it be argued that the present curtailment in demand is due in any way to the elimination of lead in manufactured articles.

Despite greatly disturbed business conditions, more white lead was manufactured and sold during 1921 than in any other year. There is reason to believe that the demand for lead pigments will gradually increase, although it will be remarkable if 1922 exceeds the record of 1921.

The storage-battery industry, which is second in importance to that of the paint industry, operated between 50 and 60 per cent. of capacity in 1921. The outlook for 1922 is somewhat better, but the most optimistic manufacturers do not expect the business for the new year to approximate the record year of 1920. The industry as a whole should grow and probably will grow faster in the next decade than any other lead-consuming industry, and before long it is possible that in prosperous times it will consume as much lead as the paint industry.

Many lead-incased cable factories were running full time in 1921, although the probable lead consumption was about 75 per cent. of normal. Lighter cables and possibly thinner sheathing were partly responsible for the reduction, and some important factories were not running full time. Business in 1922 is expected to be on about the same scale, although, as a matter of fact, the diminishing industrial loads have

undoubtedly enabled the public-service corporations in the big cities to get through the short days of winter on a minimum of cable, and a resumption of business might create a big demand for this grade of cable. With the growth of the telephone and the increase of underground power conductors, the cable industry should always maintain its important position with respect to the lead industry.

Lead pipe, traps, and other blue-lead products used in the building trades were in fair demand during the first half of 1921, and for the last six months of the year business was even better. The industrial demand for this class of material has been poor. For the whole year the lead presses probably turned out about 80 per cent. of the normal tonnage. A large amount of building work has been planned. In certain districts the mortgage-loan market has greatly improved, and if early readjustment of labor costs occurs in the large cities, a good business may be confidently expected.

The demand for sporting ammunition, in common with the demand for paint, is usually expected to be good during hard times. The last year has proved an exception to this rule. The demand from the Southern States was particularly poor, the consumption of lead by this industry being between 50 and 60 per cent. of normal. There is nothing in the present situation to indicate a great increase in activity during 1922.

With the curtailment in general industrial business, the demand for bearing metals of all kinds has fallen off greatly and certainly may not be expected to be worse in 1922.

There was a small demand for sheet lead throughout the year; probably less than 30 per cent. of the normal production was marketed. Added to the poor industrial situation, the low price of cotton adversely affected the demand for this commodity. With the higher price of cotton, the growers will buy fertilizers, and the chemical companies should come into the market for some sheet lead before the summer of 1922. Activity of the lead mills, however, will depend on general business conditions.

The redeeming feature of the foil business in the last year has been the buying by the cigarette manufacturers. Though the demand for foil for other purposes fell off greatly, the entire industry operated at from 60 to 75 per cent. of capacity. This industry in a normal year is estimated to consume about 25,000 tons of lead. The demand for foil is affected by the price, and with the present low cost of lead the industry should experience a decided improvement. Should the custom of wrapping chewing-gum in foil again be adopted by the prominent makers, the outlook would be bright. The consumption of type-metals runs about the same from year to year. The demand for solder, caulking

lead, rubber, glass and oil oxides and counterweights for locomotive driving wheels has been small owing to the general business depression. Though each of the above-mentioned uses consumes a relatively small amount of lead, in the aggregate at least 50,000 tons in normal times is used for these purposes.

The visible stocks of lead at no time during the last year became unwieldy. On the other hand, they are at this time decidedly unbalanced. The stocks of desilverized lead today are small, probably smaller than the average stocks before the war. Missouri lead, on the other hand, is held in fairly large quantities. The activity in white lead, which has saved the lead-mining industry from an almost complete shut-down, has placed a premium on lead of a corroding quality.

In August, the freight-rates from the Rocky Mountain states to North Atlantic ports were greatly reduced to meet the rail and water competition via the Panama Canal. There was no corresponding reduction in all-rail rates to intermediate points from the West or from the Mississippi Valley to Boston, New York, Philadelphia, or Baltimore. The large imports through the ports of New York and Philadelphia that began to arrive in April, and the August freight reduction from Rocky Mountain points to the seaboard, had the effect of drawing the St. Louis and New York markets close together, and thus denying to Missouri lead its usual outlet in the East. As before stated, the sheet-lead and battery industries, both large users of Missouri lead, were far below normal. Manufacturers of foil, cable, caulking lead, lead pipe, babbitt, and other lead alloys, situated in the East, who in the past had used some Missouri lead, used desilverized almost exclusively. The Spanish lead brought to Atlantic ports was sold largely to Eastern manufacturers. The combination of these circumstances brought about the conditions responsible for the accumulation of stocks of Missouri lead and the comparative scarcity of desilverized lead. Invisible stocks are low, as manufacturers in general have been following a hand-to-mouth policy of purchasing.

Prices.—The average quoted price of lead for prompt delivery at New York for the year was a little under 4.7 cts. per lb., as compared with an average selling price of 8.0 cts. in 1920. At the beginning of 1921 the price was 4.69 cts., but it rose to 5.375 cts. in the last half of January, and then by the first of March had dropped to 4 cts. flat. A recovery to 5.3 cts. took place early in May, after which the price came down to 4.4 cts. in the latter part of June. After holding for July and August at about 4.5 cts., the price gained 2 tenths of a cent by September, holding at about 4.75 cts. until the close of the year.

AVERAGE MONTHLY PRICE OF LEAD PER POUND IN NEW YORK (*a*)

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
1907..	6.000	6.000	6.000	6.000	6.000	5.760	5.288	5.250	4.813	4.750	4.376	3.658	5.325
1908..	3.691	3.725	3.838	3.993	4.253	4.466	4.477	4.580	4.515	4.351	4.330	4.213	4.200
1909..	4.175	4.018	3.986	4.168	4.287	4.350	4.321	4.363	4.342	4.341	4.370	4.560	4.273
1910..	4.700	4.613	4.459	4.376	4.315	4.343	4.404	4.400	4.400	4.400	4.442	4.500	4.446
1911..	4.483	4.440	4.394	4.412	4.373	4.435	4.499	4.500	4.485	4.265	4.298	4.450	4.426
1912..	4.435	4.026	4.073	4.200	4.194	4.392	4.720	4.569	5.048	5.071	4.615	4.303	4.471
1913..	4.321	4.325	4.327	4.381	4.342	4.325	4.353	4.624	4.698	4.402	4.293	4.047	4.370
1914..	4.111	4.048	3.970	3.810	3.900	3.900	3.891	3.875	3.828	3.528	3.683	3.800	3.862
1915..	3.729	3.827	4.053	4.221	4.274	5.932	5.659	4.656	4.610	4.600	5.155	5.355	4.673
1916..	5.921	6.246	7.136	7.630	7.463	6.936	6.352	6.244	6.810	7.000	7.042	7.513	6.858
1917..	7.626	8.636	9.199	9.288	10.207	11.171	10.710	10.594	8.680	6.710	6.249	6.374	8.787
1918..	6.782	6.973	7.201	6.772	6.818	7.611	8.033	8.050	8.050	8.050	8.050	6.564	7.413
1919..	5.432	5.057	5.226	4.982	5.018	5.340	5.626	5.798	6.108	6.487	6.808	7.231	5.759
1920..	8.561	8.814	9.145	8.902	8.576	8.323	8.338	8.687	8.177	7.070	6.159	4.727	7.957
1921..	4.821	4.373	4.084	4.356	4.952	4.485	4.410	4.382	4.600	4.690	4.683	4.700	4.545

(*a*) From *Eng. Min. Jour.*

AVERAGE MONTHLY PRICE OF LEAD PER 2240 LB. AT LONDON (*a*)
(In pounds sterling)

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
1907....	19.828	19.531	19.703	19.975	19.688	20.188	20.350	19.063	19.775	18.531	17.281	14.500	19.034
1908....	14.469	14.250	13.975	13.469	12.938	12.600	13.000	13.375	13.125	13.375	13.538	13.156	13.439
1909....	13.113	13.313	13.438	13.297	13.225	13.031	12.563	12.475	12.781	13.175	13.047	13.125	13.042
1910....	13.650	13.328	13.063	12.641	12.550	12.688	12.531	12.513	12.582	13.091	13.217	13.197	12.920
1911....	13.009	13.043	13.122	12.889	12.984	13.260	13.530	14.260	14.744	15.332	15.821	15.648	13.970
1912....	15.597	15.738	15.997	16.331	16.509	17.588	18.544	19.655	22.292	20.630	18.193	18.069	17.929
1913....	17.114	16.550	15.977	17.597	18.923	20.226	20.038	20.406	20.648	20.302	19.934	17.798	18.743
1914....	19.665	19.606	19.651	18.225	18.503	19.411	19.051	(*b*)	(*b*)	(*b*)	18.500	19.097	.....
1915....	18.606	19.122	21.883	21.094	20.347	25.170	24.611	21.946	23.151	23.994	26.278	28.807	22.917
1916....	31.167	31.988	34.440	34.368	32.967	31.011	28.137	29.734	30.786	30.716	30.500	30.500	31.359
1917....	30.500	30.500	30.500	30.500	30.500	30.500	30.500	30.500	30.500	30.500	30.500	30.500	30.500
1918....	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	31.20	40.00	30.100
1919....	37.227	28.625	27.952	24.888	23.852	22.544	23.457	24.750	25.330	28.473	34.731	41.202	28.590
1920....	47.095	50.256	46.054	39.225	38.488	34.330	34.960	36.304	35.452	35.238	32.489	24.089	37.832
1921....	23.387	20.650	18.911	20.589	23.399	22.563	23.399	23.489	23.148	23.679	24.483	25.322	22.752

(*a*) *Eng. Min. Jour.* (*b*) London exchange closed.

Foreign Market.—Demand for lead in Europe was strong during the latter part of the year. Ordinarily this demand is partly satisfied by the local production of various European countries, such as Germany, Poland, Spain, and France, plus importations from Australia. However, conditions in all of these countries are unsettled—if not politically, then industrially—affecting the production of each.

Germany is duplicating her activity in the copper market by her eagerness to absorb lead for manufacturing purposes. This is not strange when one considers the great necessity for the intense development of German export trade, and consequently of German manufacturers, to pay a large reparations bill. Germany, so long as she has a heavy indemnity to pay, should be a splendid market for raw materials, mineral, agricultural, and vegetable. Spanish lead and Mexican have been moving freely into Germany. There is a disposition to consider the fluctuations of mark exchange a deterrent to trade. However, Germany's activities in the copper markets and the unfulfilled predictions that

exchange would adversely affect them, would indicate that exchange variations will have little to do with her ability to buy lead whenever necessary.[1]

Imports and Exports.—The imports of lead in ore were about 7000 tons, furnished chiefly by Canada, Mexico, and South America, and those of lead in bullion were about 41,000 tons, almost wholly from Mexico, as compared with a total of 62,796 tons in 1920. The lead content of lead ore in bonded warehouses on Nov. 30 was 7648 tons and of base bullion 16,207 tons, as against 16,462 and 34,758 tons respectively in 1920. Part of this lead, however, may have been smelted or refined but not shipped and thus may be included in smelter stocks.

The exports of lead of foreign origin were about 33,000 tons and of lead of domestic origin about 700 tons, as compared with 23,538 tons and 2730 tons, respectively, in 1920, an increase of about 7000 tons in the total exports. The imports of refined pig lead, which for the years 1916 to 1919 inclusive had been a little over 5000 tons a year and which had jumped in 1920 to 35,719 tons, maintained that high level in 1921, being about 32,000 tons. These heavy importations were the result of the relations of the New York and European prices and the rates of exchange.

IMPORTS OF LEAD, BY CLASSES, IN POUNDS

Year.	Lead in Ore (Lead Content).	Base Bullion.		Pigs, Bars, Sheets, and Old.	Total Lead Content.
		Gross Weight.	Lead Content.		
1912	19,577,499	152,420,624	146,999,168	544,925	167,121,592
1913	19,883,313	96,908,170	94,327,654	82,999	114,293,966
1914	23,649,637	33,444,503	32,730,320	296,846	56,676,803
1915	18,185,140	86,247,995	83,986,988	819,282	102,991,410
1916	35,086,100	24,943,660	24,262,435	11,310,817	70,659,352
1917	41,292,876	107,279,997	103,664,970	11,585,974	156,543,820
1918	37,070,340	155,810,003	149,663,889	10,480,531	197,214,760
1919	19,573,856	115,317,160	112,024,518	10,214,753	141,885,718
1920	29,488,816	101,476,550	96,103,603	71,457,108	197,029,527
1921	14,234,039	77,882,834	71,733,828	62,602,534	148,570,401

IMPORTS OF LEAD, IN ORE, BASE BULLION, AND REFINED, BY COUNTRIES, IN POUNDS (*a*)

Country from Which Imported.	1915.	1916.	1917.	1918.	1919.	1920.	1921.
United Kingdom.	185,236	261,406	2,689,992	56,710	.....	.....	.....
Germany.....	.....	.....	.....	.....	.....	.....	.....
Other European countries.	32,537	314,353	255,907	5,800	.....	.....	.....
British North America .	2,303,170	12,606,216	11,738,379	28,255,878	10,327,531	7,832,583	8,098,027
Mexico.....	94,247,384	48,395,670	135,782,759	162,259,199	115,436,528	105,028,017	74,953,799
South America...	5,420,567	6,235,758	4,556,460	1,962,124	4,635,514	1,961,287	765,059
Other countries..	802,516	2,845,949	5,520,323	4,705,049	1,198,801	10,770,532	2,150,982
Total imports.	102,991,410	70,659,352	156,543,820	197,214,760	131,598,374	125,592,419	85,967,867

(*a*) Bureau of Foreign and Domestic Commerce.

[1] Market editorial, *Eng. Min. Jour.*, Dec. 24, 1921.

PIG LEAD EXPORTED FROM THE UNITED STATES (a)
(In pounds)

Destination.	1919.		1920.		1921.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Denmark	2,883,031	$227,778	851,200	$53,197	.....	.....
France	6,656,171	452,719	2,061,393	155,892	1,680,749	$78,993
Italy	.....	.....	.....	.....	.....	.....
Netherlands	1,724,949	95,721	3,763,441	311,493	.....	.....
Russia in Europe	4,000	280	.....	.....	.....	.....
Sweden	951,357	60,482	1,176,000	99,280	.....	.....
United Kingdom	46,404,068	2,851,214	5,382,207	397,502	25,851,837	1,229,126
Canada	4,147,181	242,987	3,443,536	223,945	418,410	25,811
Argentina	6,237,203	312,766	2,600,658	178,260	612,074	26,846
Brazil	3,743,199	268,315	4,936,127	376,919	1,684,179	68,466
China	1,273,194	66,791	344,897	32,263	16,786	772
Japan	23,687,710	1,077,394	7,952,080	622,688	8,344,051	341,361
Russia in Asia	5,100	425	.....	.....	.....	.....
Other countries	4,319,451	294,175	6,621,213	499,147	14,064,916	667,251
Total	102,036,614	$5,951,047	39,132,752	$2,950,586	52,673,002	$2,438,626
Total from domestic ore	21,019,605	$1,471,256	5,459,713	$462,223	3,247,294	$177,926
Total from foreign ore	81,016,588	4,479,723	33,663,553	2,486,576	49,425,708	2,260,700

(a) Bureau of Foreign and Domestic Commerce.

Secondary Lead

The production of secondary lead has increased steadily from year to year. In 1912, the U. S. Geological Survey estimated a production of 67,168 short tons. In 1919 it had reached the large amount of 125,000 tons, and in 1921 was almost as large. To this should be added the tonnage of shrapnel balls imported under the classification of type-metal and paying a 15-per cent. *ad valorem* duty. About 16,000 tons of this material was imported in 1921.

SECONDARY LEAD RECOVERED (a)

	1920. Short Tons.	1921. Short Tons.
Secondary lead recovered by smelters that treat mainly ores	12,787	.....
Secondary lead recovered by plants that treat only scrap and drosses	43,563	.....
	56,350	47,510
Secondary lead recovered in remelted alloys:		
Lead content of antimonial lead scrap treated at regular lead smelters	2,687	.....
Lead content of drosses and scrap alloys treated at secondary smelters	65,613	.....
Total lead in alloys	68,300	58,830
Total secondary lead recovered	124,650	106,340

(a) U. S. Geol. Surv.

Lead Pigments

The accompanying table shows the quantity and value of lead pigments of domestic manufacture sold in the United States, according to figures compiled by the United States Geological Survey.

PRODUCTION OF LEAD PIGMENTS IN THE UNITED STATES

Year.	Red Lead.		White Lead. (a)		Litharge.		Orange Mineral.	
	Short Tons.	Value.	Short Tons.	Value.	Short Tons.	Value.	Short Tons.	Value.
1906...	13,693	$1,874,448	123,640	$15,234,990	13,816	$1,890,050	2,927	$421,488
1907...	13,370	1,778,717	111,409	12,254,297	14,769	1,624,553	815	123,917
1908...	11,358	1,156,282	116,628	10,515,315	12,254	1,231,206	393	43,157
1909...	15,800	1,438,197	131,643	12,652,638	13,391	1,266,903	530	68,003
1910 (b)	16,116	1,482,672	134,276	13,024,762	13,659	1,283,940	541	70,335
1911 (b)	19,594	2,345,520	132,612	17,393,241	25,190	2,733,196	766	119,370
1912 (b)	21,120	2,571,702	146,833	18,683,461	29,111	3,194,194	545	88,240
1913 (b)	17,635	2,127,976	142,626	18,112,219	23,093	2,524,707	434	71,625
1914 (b)	18,697	2,151,054	159,474	19,943,239	27,345	2,856,092	426	70,019
1915 (b)	19,435	2,397,900	156,101	19,393,691	26,118	2,822,415	.....	.....
1916 (b)	23,035	3,933,566	128,979	21,274,480	37,739	5,853,543	(c)	(c)
1917 (b)	25,478	5,525,018	115,200	22,529,831	44,102	8,611,074	(c)	(c)
1918 (b)	30,069	5,928,597	102,888	20,766,848	48,874	8,825,724	(c)	(c)
1919 (b)	32,362	5,314,255	139,090	26,425,022	46,739	6,431,801	(c)	(c)
1920 (b)	34,431	7,523,089	145,695	32,337,898	62,329	12,386,185	(c)	(c)
1921 (b)	21,805	3,414,452	170,283	31,260,563	41,909	5,735,824	381	91,887

(a) The output of "sublimed white lead," a mixed sulphate and oxide of lead, is not included.
(b) U. S. Geol. Surv. (c) Orange mineral included in red lead.

IMPORTS OF LEAD PIGMENTS INTO THE UNITED STATES

Year.	Red Lead.		White Lead.		Litharge.		Orange Mineral.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1906.....	1,093,619	$50,741	647,636	$41,233	87,230	$3,737	770,342	$42,519
1907.....	679,171	35,959	584,309	37,482	90,475	4,386	615,015	37,799
1908.....	645,073	28,155	540,311	30,451	96,184	3,327	485,407	26,645
1909.....	760,179	30,428	694,599	39,963	90,655	3,740	496,231	27,562
1910.....	822,289	32,750	686,052	38,919	48,693	2,252	600,461	32,199
1911.....	1,163,533	46,170	741,071	46,213	24,662	1,196	504,734	28,515
1912.....	757,908	33,854	687,705	46,494	32,443	1,550	334,551	20,914
1913.....	99,832	4,903	672,109	45,266	34,023	1,750	330,525	22,205
1914.....	13,554	2,907	596,567	40,213	33,651	1,805	240,388	16,388
1915.....	1,968	142	239,187	24,608	20,650	1,422	171,572	14,061
1916.....	20,467	5,302	88,617	8,050	1,320	150	70,934	8,781
1917.....	50	13	20,238	1,965	*Nil.*	*Nil.*	33,294	4,892
1918	5	1	158	131	100	12	*Nil.*	*Nil.*
1919.....	7,199	1,136	21,213	2,490	*Nil.*	*Nil.*	39,781	5,081
1920.....	23,076	1,789	159,977	19,449	21,002	2,647	52,094	5,352
1921.....	12,236	689	124,176	12,598	100	7	77,937	7,830

After a long discussion the White Lead Commission at Geneva, reversing the decision of the Committee of the League of Nations, has under the lead of France agreed on the text of a new international agreement which prohibits the use of white lead in the interior of buildings. Its use elsewhere remains authorized, but will be submitted to precise regulations.

The agreement will come into force in six years. It will be sent to the Drafting Committee and will then come again before the Conference for final ratification, when a majority of two thirds of the votes will be required for acceptance. The text follows:

INTERNATIONAL CONVENTION ON THE EMPLOYMENT OF WHITE LEAD

ART. 1.—Each member of the International Labor Organization ratifying the present Convention undertakes to prohibit, with the exceptions provided for in

Article 2, the use of white lead and sulphate of lead and of all products containing these pigments in the internal painting of buildings, except where the use of white lead or sulphate of lead or products containing these pigments is considered necessary for railway stations or industrial establishments by the competent authority, after consultation with the employers' and workers' organizations concerned.

It shall, nevertheless, be permissible to use white pigments containing a maximum of 2 per cent. of lead expressed in terms of metallic lead.

ART. 2.—The provisions of Article 1 shall not apply to artistic painting or fine lining. Each Government shall define the limits of such forms of painting, and shall regulate the use of white lead, sulphate of lead, and all products containing these pigments for these purposes, in conformity with the provisions of the succeeding Articles of this Convention.

ART. 3.—The employment of males under 18 years of age, and of all females, shall be prohibited in any industrial work involving the use of white lead or sulphate of lead, or other products containing these pigments not prohibited by Articles 1 and 2.

ART. 4.—The prohibitions prescribed in Articles 1 and 3 shall come into force six years from the date of closure of the Third Session of the International Labor Conference.

ART. 5.—Each member of the International Labor Organization ratifying the present Convention undertakes to regulate the use of white lead, sulphate of lead, and all products containing these pigments, in operations for which its use is not prohibited, on the following principles:

1. (*a*) White lead, sulphate of lead, and products containing these pigments, shall not be used in painting operations except in the form of paste or paint ready for use. (*b*) Measures shall be taken in order to prevent danger arising in the application of paint in the form of spray. (*c*) Measures shall be taken, wherever practicable, to prevent danger arising from dust caused by dry-rubbing down and scraping.

2. (*a*) Adequate facilities shall be provided to enable working painters to wash during and on cessation of work. (*b*) Overalls shall be worn by working painters during the whole of the working period. (*c*) Suitable arrangements shall be made to prevent clothing put off during working hours being soiled by painting material.

3. (*a*) Cases of lead-poisoning and of suspected lead-poisoning shall be notified, and shall be subsequently verified by a medical man appointed by the competent authority. (*b*) The competent authority may require, when necessary, a medical examination of workers.

4. Instruction with regard to the special hygienic precautions to be taken in the painting trade shall be distributed to working painters.

ART. 6.—The competent authority shall take such steps as it considers necessary to ensure the observance of the regulations prescribed by virtue of the foregoing Articles, after consultation with the employers' and workers' organizations concerned.

ART. 7.—Statistics with regard to lead-poisoning among painters shall be obtained: (*a*) As to morbidity—by notification and certification of all cases of lead-poisoning. (*b*) As to mortality—by a method approved by the official statistical authority in each country.

An inquiry as to whether the use of white lead involves a risk to health—a question of concern to all engaged or interested in lead mining—was recently held by the New South Wales Board of Trade.[1] The question considered was whether white lead as used in the painting indus-

[1] *Queens. Govt. Min. Jour.*, Dec. 15, 1921.

try, was so injurious to painters and other workmen in the industry that it was expedient or necessary to regulate, restrict, or prohibit its use in paints or pigments.

The board found that it could not recommend the restriction of the use of white lead in paints or pigments, as there were no means of measuring the degree of restriction which might prevent the evils complained of.

"Lead, as used in the painting industry," the report states, "is a substantial cause of injury and death to painters. As a cause of death, lead is more effective in this industry than in any other occupation, but its toll of deaths does not, by any means, indicate its deleterious influence or destructive power.

"Nine per cent. of the 3969 persons included in the Broken Hill survey were found to show arterio-renal symptoms which might have been due to lead absorbed as the result of exposure mainly to the dust of sulphide and oxide ores. The vital statistics show that for every nineteen miners who die from lead poisoning in a series of years there are twenty-two painters who die from the same cause.

"Lead-poisoning being a preventable disease, as the medical witnesses and other authorities available to the board all agree, it would indeed be a desperate situation if the only means of prevention were the abolition of the use of lead.

"Care on the part of employees themselves is a necessary condition of the prevention of lead-poisoning. The employee can avoid the unnecessary raising of dust, the splashing of lead material to a great extent, and eating or smoking with unwashed hands. Personal hygiene is a matter of supreme importance with those who are exposed to lead risks. The surface of the body, the nails, the mouth, and the teeth ought to be kept clean by the lead worker if he desires to preserve normal health. Cleanliness in clothing and working overalls, a reasonably normal dietary, and the avoidance of intemperance all help to strengthen the defences against lead-poisoning. Regulation of the use of white lead in the painting industry is immediately necessary, both in the interests of painters and the community."

The board recommended that the following conditions should be embodied in local legislation: Locally applied exhaust ventilation, so as to remove dust and fumes at the point of origin; cleanliness of tools and workrooms; notification to Government authorities of all cases of lead-poisoning and compensation therefor; periodic medical examination of the persons employed in such processes; provision of sufficient and suitable cloakroom, washing, and mess-room accommodation, and of special protective clothing; prohibition of bringing food or drink into workrooms.

PRIMARY LEAD SMELTED OR REFINED IN THE UNITED STATES (a)
(Short tons. Apportioned according to source of ore)

	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921
Domestic Ore:									
Alaska	6	.....	358	659	884	531	645	591	773
Arizona	4,901	5,602	6,953	15,328	7,456	6,195	5,407	5,987	3,313
Arkansas	.....	52	51	170	300	14	.....	.....	.....
California	3,294	3,698	5,606	3,633	11,471	6,228	2,004	2,260	614
Colorado	42,840	41,198	32,352	33,046	29,327	29,395	18,867	17,752	12,104
Idaho	137,802	177,827	160,680	170,059	174,045	142,640	89,091	117,191	99,707
Illinois	619	427	910	670	867	1,010	977	948	271
Iowa	.....	34	.....	.....	.....	.....	.....	.....	.....
Kansas	1,504	1,043	1,320	1,737	2,663	5,023	7,951	8,421	10,939
Kentucky	16	16	95	37	21	109	83	114	41
Missouri	152,430	194,275	195,634	218,253	218,197	187,743	150,341	171,999	151,028
Montana	3,256	4,386	4,853	4,961	5,933	17,586	17,513	13,231	11,565
Nevada	6,142	5,996	7,664	11,858	12,334	8,726	5,958	8,650	3,553
New Mexico	1,821	741	2,157	3,290	3,428	5,140	1,418	1,123	384
New York	.....	.....	.....	.....	.....	49	.....	.....	.....
North Carolina	10	.....	.....	.....	.....	.....	.....	.....	.....
Oklahoma	3,214	3,916	4,346	10,969	19,646	58,755	49,984	68,494	46,902
Oregon	37	17	11	9	.....	6	.....	.....	.....
South Dakota	7	2	5	12	34	28	18	6	2
Tennessee	.....	.....	8	.....	.....	843	2,371	2,705	.....
Texas	108	89	111	26	58	30	8	1	1
Utah	71,069	88,976	106,105	111,789	82,081	76,169	65,102	64,006	51,872
Virginia	878	143	457	740	147	59	.....	.....	.....
Washington	9	2	11	217	929	906	1,090	2,460	325
Wisconsin	2,639	1,818	2,632	3,121	2,930	4,275	3,975	3,841	1,079
Undistributed	63	99	131	159	145	59	119	201	101
Zinc residues	3,765	4,125	4,567	5,478	6,489	5,359	4,887	4,366	713
Total from domestic ore	436,430	534,982	537,012	596,221	579,385	556,878	427,825	494,347	395,287
Foreign Ore:									
Africa	5,976	2,942	.....	328	1,738	1,519	644	1,171	.....
Australia	.....	.....	.....	.....	.....	282	69	450	.....
Canada	16	2	1,174	1,231	1,100	7,550	1,895	1,186	2,877
Central America	.....	.....	1	7	.....	.....	12	22	6
Mexico	4,512	2,386	5,437	1,917	7,607	4,798	2,261	2,729	1,912
South America	2,617	1,821	2,829	2,366	1,533	1,101	2,537	2,747	2,235
Other foreign	102	488	140	236	3,894	84	238	109	90
Foreign Base Bullion:									
Canada	.....	.....	.....	1,072	6,750	8,108	567	1,919	1,599
Mexico	37,359	21,689	33,173	11,598	39,508	76,809	49,564	42,421	41,648
South America	.....	.....	275	151	189	39	.....	54	.....
Total from foreign ore and base bullion	50,582	29,328	43,029	18,906	62,319	100,290	57,787	52,808	50,367
Grand total, derived from all sources	487,012	563,810	580,041	615,127	641,704	657,168	485,612	547,155	445,654

(a) C. E. Siebenthal, U. S. Geol. Surv.

LEAD MINING IN THE UNITED STATES

The following reports, except where otherwise noted, are from the U. S. Geological Survey.

Alaska.—The lead production of Alaska in 1921 was valued at $46,000 as compared with a production valued at $140,000 in 1920.

The Kantishna district, just north of Mount McKinley, has long been the scene of a little placer mining, as well as of small developments of gold- and silver-bearing lodes. Two years ago a galena deposit was opened up, and since then about 1000 tons of ore has been shipped.

The district is about 50 to 70 miles west of the Alaska Railroad, but it has no road connection with that line, and the ore had to be transported by horse sleds to Kantishna River and thence by small steamers to the Tanana. This method of transportation was so expensive that only the richest ore would stand shipment. Therefore the galena ore was hand picked, the grade of shipments being thus brought to an average of about 182 oz. of silver and $3.20 in gold to the ton, in addition to the lead and some copper. The lode from which this ore came and others at near-by localities are at or near Eureka Creek. The deposits lie in well-defined fissures traversing schistose rocks and are associated with granitic intrusives. Some of the orebodies are 8 to 15 ft. wide, but the rich galena is in shoots from 6 in. to 2½ ft. in width. Gold-bearing quartz veins of similar type are also found in this part of the district, as well as some deposits of antimony (stibnite). The few openings made indicate that the lodes are fairly persistent along the strike.

In 1921 sulphide-bearing lodes were discovered in the foothills of the Alaska Range 20 miles southeast of Eureka Creek, in the Kantishna district. These deposits were found by O. M. Grant and F. B. Jiles, both experienced prospectors, who staked 22 claims. They lie some 14 miles from timber, but lignite beds are close at hand. They are readily accessible to pack-horses. The construction of about 50 miles of wagon road would connect the locality with the Alaska Railroad at Riley Creek. Granodiorite is the prevailing country rock of the region and is found both in large areas and as dikes. Banded and massive quartzites with some limestones and slate cut by granodiorite dikes constitute the formations in which the ores have been found. The sedimentary beds are much deformed and trend a little north of west.

The orebodies are distributed through a zone that trends a little north of east and thus apparently cuts across the bedding of the sediments. It has been traced about 2 miles and is reported to be longer. As determined by present discoveries, its width is from ¼ to 1 mile wide. This zone is characterized by an abundance of sulphide minerals, concentrated in more or less well-defined orebodies.

Arizona.—The mine production of lead in Arizona decreased from 14,599,765 lb. in 1920 to about 6,541,433 lb. in 1921. The value of the output decreased from $1,167,981 to about $294,364. No shipments of lead ore or concentrate were made from the Shattuck mine, which was the largest producer of lead in 1920. Much silver-lead ore, however, was shipped from the Copper Queen mine, especially from September to the close of the year, and the Bunker Hill Co., at Tombstone, shipped much lead ore as well as silver ore to El Paso, Tex.

California.—California produced 1,124,276 lb. of lead in 1921, com-

pared with 4,813,510 lb. in 1920. The market for lead, copper, and zinc ores during the past year was so poor that very few mines operated.

Colorado.—C. W. Henderson reports that Colorado produced only 20,600,000 lb. of lead in 1921. This is a decrease of 24,783,025 lb. from the 1920 production.

The Leadville and Durango lead-copper smelters did not operate all their furnaces. The Pueblo lead-copper smelter continued operations until the flood of June 3, when the plant was closed. The River Smelting and Refining Co.'s matting and volatilization plant for the treatment of zinc-lead-copper ores at Florence was idle until December, when it reopened on stock ores.

Leadville, one of the oldest and most persistently producing districts in Colorado, which mines many kinds of ore and shows great fluctuation in production according to changes in the prices of metal, was affected seriously by the low prices for lead and zinc. The Yak mine continued development and made shipments of silver-iron ore. It is proposed to equip the old Yak mill building with new machinery, including that for flotation to treat the lead-zinc-iron sulphide ores of the Yak properties. The A. V. smelter operated three furnaces throughout the year.

Lead production, by counties, was as follows, in pounds:

County.	1920.	1921.
Boulder	226,825	170,000
Chaffee	399,123	325,000
Clear Creek	3,284,612	1,264,000
Custer	171,560	97,000
Dolores	757,052	19,000
Eagle	292,528	10,300
Gilpin	438,289	80,000
Gunnison	852,080	9,500
Hinsdale	79,690	66,000
Lake	9,543,758	3,202,000
La Plata	949	2,500
Mineral	531,536	153,300
Ouray	1,302,681	1,124,400
Park	1,085,665	679,000
Pitkin	4,490,648	2,300,000
Grand	528	.....
Saguache	160,140	273,000
San Juan	14,741,907	2,191,000
San Miguel	7,550,027	8,258,000
Summit	448,217	376,000
Teller	25,210	.....
Total	45,383,025	20,600,000

Idaho.[1]—The production of lead decreased from 249,609,976 lb. in 1920 to 210,100,194 lb. in 1921, with a value of $9,559,559. The value of the 1921 output based on 1920 prices would have been $16,808,016, a difference, or loss, of $7,248,457, caused by the reduced price of lead, which averaged 8 cts. per lb. in 1920 and 4.55 cts. in 1921.

[1] Annual Report, Idaho Inspector of Mines.

Following is the lead production of Idaho, by counties:

	Pounds.	
	1920.	1921.
Blaine	2,149,593	4,870,692
Boise	1,650	.....
Bonner	2,307	11,452
Boundary	3,429,540	1,818
Butte	144	67,812
Camas	6,319	.....
Custer	1,932,088	803,092
Gem	879	.....
Lemhi	5,876,375	2,164,670
Owyhee	780	.....
Shoshone	236,310,301	202,175,364

The lead production of Idaho since 1903 is as follows:

	Pounds.	Value.
1903	213,143,618	$9,135,335
1904	233,096,375	10,197,966
1905	259,812,428	12,211,184
1906	255,014,446	14,535,823
1907	233,823,854	12,392,664
1908	206,827,816	8,686,768
1909	215,986,285	9,287,410
1910	228,258,839	10,043,389
1911	272,556,525	12,265,044
1912	284,185,657	12,788,355
1913	317,871,945	13,986,366
1914	348,526,069	13,592,517
1915	345,999,466	16,261,975
1916	375,081,781	25,880,643
1917	393,559,521	33,846,119
1918	294,695,993	20,923,416
1919	182,341,898	9,664,121
1920	249,609,976	19,968,798
1921	210,100,194	9,559,558

The Bunker Hill and Morning mines were the largest producers of lead in 1921, and the Hecla mine increased its output. Other large producers were the Hercules, Tamarack & Custer, Caledonia, Independence (Blaine County), Sierra Nevada, Idaho Continental (Boundary County), and Pittsburg Idaho (Lemhi County). The mill of the Gold Hunter Mining & Smelting Co. was idle, but first-class lead ore rich in silver was shipped by lessees. The Coeur d'Alene district alone produced about 183,000,000 lb. of lead.

Joplin District.[1]—Lead concentrates were on $55 basis for 80 per cent. lead at the beginning of 1921, declining to $50 on the first and to $35 at the end of February, continuing to mid-March, when it advanced to $40 on the upward trend to $60 in the middle of May, then declining steadily to $40 by the end of June. The reaction following sent it as steadily upward to $60 at the end of September, dropping to $55 at the end of October and to $53.50 at the end of November, when it was advanced by renewed demand to $54, and closed the year at $58.

[1] Jesse A. Zook, *Eng. Min. Jour.*, Feb. 4, 1922.

LEAD ORE PRICES IN THE JOPLIN DISTRICT
(Per ton of 2000 lb.)

	Past Years.		1921.	
	High.	Average.		
1908	$66.00	$54.66	January	$49.47
1909	60.50	54.56	February	47.02
1910	58.00	51.98	March	45.51
1911	64.00	56.76	April	44.98
1912	68.00	56.60	May	56.19
1913	58.00	52.52	June	48.17
1914	54.50	46.55	July	44.97
1915	80.00	55.08	August	49.61
1916	104.84	84.07	September	53.56
1917	135.50	98.00	October	59.65
1918	106.00	88.98	November	58.82
1919	89.00	66.20	December	56.99
1920	112.50	95.71		
1921	65.20	51.92	Year	$51.92

Montana.—The mine production of lead in Montana decreased from 31,253,916 lb. in 1920 to 20,366,917 lb. in 1921, and the value of the output decreased from $2,500,313 to about $916,511. Some of the largest producers of lead, such as the Butte & Superior, Anaconda, Snow Storm, and Angelica, were either idle or operated at reduced capacity in 1921. The Snow Storm mine, at Troy, resumed milling operations in November, and the new 750-ton mill of the Boston & Montana Co., at Wise River, Beaverhead County, made its first concentrates. The Neihart Consolidated at Neihart, Block P. near Monarch, Lukens Hazel at Libby, Evening Star at Elliston, and Greenback near Alder were especially active in producing silver-lead ore in 1921. The smelting plant of the American Smelting & Refining Co., at East Helena, was active in 1921 and shipped an increased quantity of lead bullion, which was made largely from ore shipped from mines in Idaho.

The Montana lead production, by counties, is given as follows, in pounds:

	1920.	1921.
Beaverhead	1,968,009	234,407
Broadwater	401,551	287,358
Cascade	3,127,148	1,498,387
Fergus	358	.....
Granite	76,033	421,102
Jefferson	3,414,357	817,266
Judith Basin	.....	1,715,151
Lewis and Clark	829,987	434,788
Lincoln	3,328,265	1,007,768
Madison	287,408	540,506
Mineral	43,848	18,226
Missoula	.....	9,488
Park	95,680	1,292
Powell	88,721	136,364
Sanders	.....	3,317
Silver Bow	17,590,182	13,241,497
Toole	2,369	.....
	31,253,916	20,366,917

Nevada.—The mine output of lead decreased in quantity from 21,263,700 lb. in 1920 to about 7,188,768 lb. in 1921, and in value from $1,701,096 to about $323,495. The mines of the Yellowpine district, Clark County, were practically idle, and the Prince Consolidated mine at Pioche was active only three months. Most of the lead ore came from the Bristol Silver, Prince Consolidated, and Virginia Louise, at Pioche; the Eureka Holly, Eureka Croesus, and Richmond Eureka, at Eureka; the Leadville mine, near Gorlach; and the Spruce Monarch, south of Tobar. Mill operations were started at the Simon mine in Mineral County.

The first carload of lead concentrate from the Simon Silver-lead Mining Co.'s new mill, situated near Mina, Nev., was delivered to the U. S. S. smelter at Midvale, Utah, late in December.[1]

New Mexico.—The U. S. Geological Survey reports that New Mexico's lead production was 678,601 lb. in 1921. This compares with 2,869,525 lb. produced in 1920.

Utah.—The mine output of lead decreased from 140,838,113 lb. in 1920 to about 89,187,269 lb. in 1921. The value of the output decreased from $11,267,049 to about $4,013,427. As the average price of lead was about 4.50 cts. a lb., it was not profitable to ship lead ore unless it contained much silver. The largest producer of lead was the United States Mining Co., at Bingham, but the Utah Apex and Utah Consolidated mines were idle. The output from the Tintic, Park City, and Bingham districts was decidedly less. The closing of the lead smelter at International in July seriously affected shipments from Ophir, Park City, and Eureka.

The mines of the Tintic district produced about 32,543,000 lb. of lead. The shipments from the Park City region accounted for 16,425,000 lb. of lead. The lead smelters at Midvale and Murray were operated at a reduced rate during the year. At International the copper plant was idle and the lead plant was closed in July. In August the freight on bullion was reduced, and by December the smelters had disposed of surplus stocks and were merely shipping the current production.

The production of lead in Utah, by counties, is given as follows, in pounds:

	1920.	1921.
Beaver	2,808,314	1,271,131
Box Elder	18,130	7,306
Juab	27,902,353	27,186,059
Piute	859,753	1,597,626
Salt Lake	59,162,056	29,619,285
Summit	18,220,550	10,507,694
Tooele	10,272,259	2,538,512
Utah	14,083,144	9,267,537
Wasatch	7,511,554	7,183,528
Weber	.....	8,591
	140,838,113	89,187,269

[1] *Min. Sci. Press.*

Washington.—The mine output of lead decreased from 5,787,247 lb. in 1920 to 143,553 lb., valued at $6460 in 1921. It was unprofitable to ship lead ore from the Electric Point and other mines near Northport, as the ore contains little or no silver.

LEAD PRODUCTION OF THE WORLD
(In metric tons)

Year.	Australia. (a)	Austria. (a)	Belgium. (a)	Burma. (a)	Canada. (a)	France. (a)	Germany. (a)	Greece. (a)	Hungary. (a)
1906	93,557	14,846	23,765	.....	24,580	25,614	150,741	12,308	1,925
1907	96,608	13,598	27,450	.....	21,660	24,800	164,079	13,814	1,468
1908	119,207	12,669	35,650	.....	19,593	26,112	164,079	15,892	1,544
1909	77,992	12,941	40,306	.....	23,295	26,927	167,920	14,948	1,590
1910	105,897	15,476	40,715	.....	14,967	20,226	159,851	16,710	2,077
1911	105,397	18,097	44,308	.....	10,791	23,635	161,287	14,234	1,583
1912	113,710	19,993	54,940	.....	16,226	31,080	192,618	14,498	1,605
1913	110,444	1,368	53,590	5,951	17,089	28,817	181,100	18,309	(e)1,790
1914	101,788	755	45,560	10,717	19,888	29,601	198,450	20,684	1,368
1915	102,721	.....	16,770	13,758	21,009	14,539	134,750	11,595	.....
1916	134,072	.....	15,560	14,011	18,823	24,276	106,807	9,424	.....
1917	144,950	783	22,745	17,233	14,776	21,235	86,228	1,422	.....
1918	163,368	.....	20,630	19,380	23,314	12,778	69,960	4,093	.....
1919	83,404	.....	4,225	19,396	19,880	10,928	51,480	3,841	.....
1920	(i) 6,933	(i)3,973	16,040	24,198	16,309	(i)12,000	(i)59,000	(i)4,857	.....
1921	(i)56,641	(i)4,000	21,000	33,721	30,457	(i)13,000	(i)72,000	(i)18,000	.....

Year.	Italy. (a)	Japan. (a)	Mexico. (a)	Rhodesia. (i)	Spain. (a)	Sweden. (a)	United Kingdom. (a)	United States.	Totals. (f)
1906....	21,268	4,305	(b)73,699	.....	185,470	753	29,675	323,567	986,980
1907....	22,978	3,067	(b)76,158	.....	(d)185,800	813	35,730	322,854	1,011,397
1908....	26,003	2,910	(b)127,010	.....	188,062	277	32,816	284,858	1,057,205
1909....	22,133	3,429	(b)118,186	.....	179,993	166	30,878	329,690	1,056,326
1910....	14,495	3,907	(b)120,662	.....	190,523	355	30,799	353,186	1,093,043
1911....	16,684	4,160	(b)124,605	.....	189,810	1,134	28,327	368,301	1,108,880
1912....	21,450	3,613	(b)109,717	.....	232,612	1,073	27,728	376,947	1,212,252
1913....	21,674	3,777	(i)62,000	.....	198,829	1,235	18,462	396,034	1,142,264
1914....	20,464	4,563	(i)23,598	.....	143,524	1,396	19,684	485,011	1,127,051
1915....	21,812	4,764	(i)31,384	485	171,472	1,918	15,767	487,177	1,049,921
1916....	24,362	11,343	(i)19,966	1,264	147,407	2,076	12,775	540,892	1,083,058
1917....	16,237	15,807	(i)46,612	3,882	172,909	3,174	11,431	(g)527,729	1,107,153
1918....	18,332	10,769	(i)88,503	9,308	169,709	2,241	11,269	(g)504,614	1,128,268
1919....	16,530	5,771	(i)78,645	12,859	125,721	827	11,458	(g)412,704	857,669
1920 ...	15,947	(i)4,179	(i)85,209	14,835	175,195	863	11,136	(g)427,966	878,640
1921....	11,500	(i)6,780	60,513	18,577	(i)120,000	(i)750	(i)10,000	(g)369,136	846,075

(a) From official reports of countries unless otherwise denoted. (b) Exports. (d) U. S. imports. (e) Estimated. (f) The totals may be high on account of duplications which cannot be eliminated. (g) From *Eng. Min. Jour.* (h) Production of pig lead in Mexico. Lead smelted from Mexican ore in the United States is not included either under Mexico or the United States. (i) Am. Bur. Metal Stat.

Lead in Foreign Countries

Algeria.—The following statistics, relating to the production of the lead mines in all of Algeria during the year 1920, were published in *L'Information*, Nov. 16, 1921:

Province of Alger: Chabel-el-Kohol (Société de Chabet-et-Kohol), 562 metric tons of lead ore; Sakamody (Banque Atlas), 14 tons. Province of Constantine: Bou Thaleb, 599 tons of lead ore; Djebel Gustar (Compagnie du Djendii), 171 tons; Sidi Kambi (groupe constantinois), 828 tons; Mestoula, 6300 tons; Djebel Felten, 3234 tons; Nador (Vieille-Montagne), 4379 tons.

Official statistics give the total exports of lead ore from Algeria in 1920 as 12,804 metric tons, which fell to 11,421 tons in 1921. Of the 1921 exports 8213 tons went to France.

Australia.—After well over two years' interruption of work, lead production at Port Pirie was resumed on Aug. 18, 1921, on a comparatively restricted scale. Misfortune has dogged the Broken Hill group for some time. In May, 1919, the great strike began which entailed the closing a couple of months later of the smelting plant, the stocks of concentrates having been used up. In November of the following year the strike ended, and the smelter resumed operations soon after, but in January of this year a disastrous fire occurred there, which forced a fresh suspension till Aug. 18, as stated. Prior to the war the smelter treated some 6000 tons of concentrates a week, but the reconstructed plant has a roasting capacity of only half this quantity, and with the present facilities the lead output cannot exceed about 65,000 to 70,000 tons a year. After supplying the needs of the Far Eastern market, probably 45,000 tons will be left for Europe, but much, of course, depends upon whether or not costs and selling prices are sufficiently favorable to permit of profitable operations. For production to be maintained even at the reduced rate, conditions must be more acceptable than they are to-day.[1]

Canada.[2]—Notwithstanding the general decline in prices during 1920 and 1921, the quantity of lead recovered by the Canadian smelters and contained in shipments exported showed a notable increase. Of the three producing provinces British Columbia made the most notable increase, while normal production was maintained by Ontario and Quebec. The price of lead on the Montreal market, which was 11 cts. per lb. in March, 1920, had, by December of the same year, fallen to 6.75 cts. per lb. During the calendar year 1921 the average price on the Montreal market in car lots was 5.742 cts.

The Dominion production from all sources amounted to 67,146,011 lb., which at the average Montreal price for the year was valued at $3,855,524. Compared with 1920, the production showed an increase of 86.75 per cent. in quantity above the 35,953,717 lb. produced in that year and 19.95 per cent. above the value recorded, namely, $3,214,262 (8.940 cts. per lb.). The lead production included the refined lead and pig lead produced in Canada from the treatment of domestic ores, together with the lead estimated as recovered from ores exported to the United States.

The 1921 production was composed of 59,023,488 lb. of refined lead produced at Trail; 3,309,793 lb. of pig lead from the lead smelters at Galetta, Ont., and the estimated quantity of 4,812,730 lb. recovered from

[1] *Metal Bull.*, Aug. 23, 1921.
[2] Prelim. Rept. Min. Prod. of Canada, 1921, Dominion Bur. of Statistics.

exported ores. The lead ores exported amounted to 4835 tons, having a content of 5,360,000 lb., 90 per cent. of which was estimated as recovered. These exported ores were principally from the East and West Kootenays and the Yukon Territory, supplemented by small shipments from Notre Dame des Anges in Quebec. The total mine shipments of lead ores and concentrates were in the neighborhood of 304,000 tons containing approximately 67,139,300 lb. of lead.

The record of lead contents of lead ores and concentrates shipped and recoveries made from domestic and imported ores are shown below, together with a record of pig and refined lead produced.

	1918. Pounds.	1919. Pounds.	1920. Pounds.	1921. Pounds.
(1) Lead contents of ores and concentrates shipped from mines in Canada.....	46,843,602	32,147,989	33,802,270	67,139,303
(2) Production: Smelter recoveries from Canadian ores and recoverable lead in ore exported.....	51,398,002	43,827,699	33,985,974	67,146,011
(3) Total production of refined lead in Canada (including lead from imported ores).....	31,571,112	34,330,920	28,720,030	57,640,000

So far as lead and zinc are concerned, the Trail smelter in British Columbia has broken all its records, and the smelter operated throughout the year, full blast. For the last six months every plant at Trail connected with either of those metals broke its own record month by month, incident to the improvements in treatment. There is another angle to this, it being obvious that large-scale operation is necessary if costs are to be at the minimum, which they must be in order to make operation reasonable. An example of this expansion of output is the test mill at Trail, built for the Sullivan ore, whose original capacity of 500 tons per day has now worked up to 1000 tons, which is probably not yet the limit. The lead and zinc ores are no longer shipped separately, but all the Sullivan ore goes by one route, being separated in the course of milling, the zinc plant producing lead concentrate as a by-product. The concentrator is recovering more lead as a high-grade lead concentrate, and more zinc as a high-grade zinc concentrate, so that a ton of Sullivan ore nowadays yields more pounds of refined metal than such a ton did formerly. This is a very moderate statement of the facts. Various processes have been devised and given a trial in the test mill, but flotation is the basis of the present satisfactory recoveries. Incidentally a certain old criticism of the Trail smelter must now be revised, for it can no longer be contended that the Sullivan ore is being financed at the expense of shipments from private mines, when there is no zinc ore from private shippers to mix with the Sullivan ore.[1]

[1] *Can. Min. Jour.*

While the metallurgical staff at Trail has been winning its victories over the Sullivan complex ore, the mines department has further developed the property by putting through the raise from the "tunnel" below to the "hill" above, thus connecting the two mines by an air-way that in the course of time will be utilized for taking out the ore below the level of the upper workings. The "tunnel," which was driven to the ledge in 1920, is at present furnishing the bulk of the ore. The most modern methods are used in mining the ore, power scrapers being used to haul the broken-down ore into the raises, where it reaches the cars by way of chutes, or, where conditions are suitable, the cars are loaded by mechanical muckers.

China.—The Chuling mining works, which is operating a lead mine in Chemping district, recently made its first shipment of lead, according to Consul M. S. Myers at Swatow, China.[1] Smelting by native methods is carried on at the mine, the present capacity of the furnaces being three short tons per day. It is planned to double this furnace capacity at an early date. A high-grade soft lead, running between 99.97 and 99.98 per cent. pure, is produced. It is shipped in slabs weighing 140 catties (about 187 lb.) each. About 115 short tons has already been exported. A ready market for this product is found in South China.

France.—The production of argentiferous lead in France is very restricted, most of the mines being shut down. On the other hand, the development of the Soc. Albigeoise des Mines de Peyrelmare, in the Tarn district, is interesting. The Peyrelmare mine, which produced 1730 tons of argentiferous lead in 1912, and 1535 tons in 1913, almost maintained full output during the war, producing 19,468 tons of ore in 1917, 26,789 tons in 1918, 18,328 tons in 1919, and 19,028 tons in 1920. During 1919 and 1920, the Lieux-Lafenasse works, attached to the mine, delivered 644 tons and 735 tons respectively of soft lead, and 644 kilos and 1367 kilos of fine silver.[2]

Germany.—During 1920 Germany imported 17,306 tons of pig lead. The main sources of supply were as follows: United States, 3336 tons, Great Britain 3715 tons, Central America 2258 tons, Belgium 1303 tons, Holland 1320 tons, Italy 1251 tons, Denmark 804 tons, and Austria 640 tons. The exports were mainly to England (4086 tons) and totaled 8757 tons.

The German exports of lead pipes and sheets during 1920 were 5278 tons, of which Holland took 2561 tons and Finland 700 tons.

Great Britain.—Lead mining is of great antiquity in the British Isles, dating back to the time of the Roman occupation; and for many centuries

[1] *Comm. Rept.*, Dec. 19, 1921.
[2] *Metal Bull.*

large quantities of lead ore were obtained from outcrops and shallow workings. Deeper mining, involving pumping, belongs to a comparatively late period, but was carried on vigorously during the last century.

Consequently, the more accessible and richer ore-shoots are now exhausted, and in general it is where natural difficulties (such, for instance, as the presence of more water than could be dealt with by the appliances in use) hindered exploitation that the richer orebodies have been preserved for the miners of to-day. A notable example of this is the Halkyn district of Flintshire, where the lodes in the mountain limestone are so heavily watered that they could not be mined to any considerable depth with ordinary pumping appliances. The driving of a drainage tunnel, which was completed about 1886, enabled them to be worked down to 200 ft. above sea-level. A new tunnel has been commenced and would, if continued as projected, unwater the mines down to sea-level, thus rendering a large quantity of valuable lead ore available for mining.

UNITED KINGDOM LEAD EXPORTS (*a*)
(In long tons)

	1919.		1920.		1921.	
	English.	Foreign.	English.	Foreign.	English.	Foreign.
January	1,042	.....	2,631	2,048	1,165	445
February	596	.....	2,707	2,904	1,331	551
March	1,252	.....	3,987	3,540	1,738	2,326
April	1,030	203	2,651	2,259	935	1,130
May	1,023	229	2,366	951	883	1,710
June	1,073	132	2,508	1,172	600	615
July	1,854	220	3,855	105	952	1,090
August	4,091	700	3,428	1,679	855	1,127
September	2,145	1,114	3,841	5,025	1,332	611
October	4,222	3,181	3,146	3,937	2,519	691
November	3,298	2,576	2,069	1,865	2,088	755
December	3,944	2,449	1,439	1,660	1,828	792
Total	25,570	10,803	34,628	27,145	16,226	11,843

UNITED KINGDOM LEAD IMPORTS (*a*)

From	1918.	1919.	1920.	1921.
Spain	49,977	39,502	58,149	66,333
U. S. A.	61,576	53,008	9,756	11,716
Mexico	.....	2,114	1,049	.....
Australia	85,280	93,276	57,987	12,534
Elsewhere	11,099	29,710	35,909	42,019
	207,932	217,610	162,850	132,602

(*a*) British Board of Trade Returns.

During the last 50 years lead mining in the United Kingdom has suffered a serious decline. This is clearly shown by the uninterrupted fall in production during that period. In 1863 the production of dressed lead ore, of about 80 per cent. lead content, amounted to 91,283 long tons. By 1913 it had fallen to 24,282 tons, and by 1918 to 14,784 tons,

the latter figure being equivalent in terms of lead (the lead concentrate is taken to contain 74 per cent. of recoverable metal) to 0.93 per cent. of the world's production, and slightly less than 6 per cent. of the normal British consumption. At the present price of the metal lead mining should be a profitable undertaking, and some material increase in production may be looked for.[1]

India.—The report of the Burma Corporation makes anything but pleasant reading for shareholders in that concern, for not only have anticipations not been anything like fulfilled, but a serious modification or cancellation of plans of extension is envisaged. This, however, has become the common fate of programs based upon the world-wide belief that an era of peace and prosperity was at hand when the war ended. The result, so far as the Burma Corporation is concerned, is the decision:

(*a*) To close up the construction of the zinc works in India, as financial considerations prevented the Government of India contributing the anticipated loan and the Tata Iron and Steel Co. desired to limit its participation.

(*b*) To discontinue the erection of the new lead smelter, and to rely upon the extension and improvement, at a much smaller cost, of the existing smelter.

(*c*) To suspend for the time being all further expenditure on the development of the Namma coal field.

Instead, therefore, of treating over 1500 tons of ore a day, the silver-lead program now in sight provides for the annual output of 45,000 tons of refined lead, and of 4,500,000 oz. of silver from a daily treatment of 700 tons of ore. This is, nevertheless, a great advance upon present figures. The canceled program involved the construction of a smelter having an annual capacity of 60,000 tons of lead, and of 5,000,000 oz. of silver. Construction work was actually started, and £1,000,000 was raised on debentures to enable the plans formulated to be carried out.[2]

At the last annual general meeting of the Burma Corporation the Chairman referred to the appointment of E. P. Mathewson to visit the property, who has now issued his report. The conclusions arrived at are as follows:

1. That a daily average production of 700 tons of ore can be maintained when the necessary labor force is secured.

2. In order to treat this ore currently, the facilities for transportation by rail must be adjusted, and these can be provided when required.

3. To treat this tonnage of ore at a minimum cost, many improvements must be made at the smelter, most of which are in progress.

[1] *Suppl. to Comm. Rept.*, 1922.
[2] *Metal Bull.*, Nov. 17, 1921.

The Directors wish to emphasize strongly the fact that the report deals only with the immediate policy of the Board, which aims at bringing the existing plant at the earliest date possible up to a capacity of 45,000 tons of refined lead, and 4,500,000 oz. of silver per annum, requiring a daily mine output of 700 tons of ore. The report does not take into consideration any increased production beyond these figures when labor and transport conditions permit, or the realization of the zinc contents of the ore, as soon as remunerative prices are obtainable.[1]

Rhodesia.—In these days of depression in the metal markets it is remarkable that a lead mine in the center of Africa should be making profits and paying dividends. But this is what, is spite of so many disadvantageous circumstances, the Rhodesia Broken Hill Development Co. has been able to do. During 1920 the yield of lead was 14,602 tons, obtained by smelting 42,806 tons of ore; the net profit, after allowance for depreciation, was £89,949, out of which £35,000 was paid as dividend, at the rate of 10 per cent., the remainder being kept in hand until income tax and excess-profits duty are settled. The deposit belonging to this company, situated in Northern Rhodesia, is one of the most interesting of all those controlled in London.[2]

Spain.—Lead ore is mined in 12 provinces of Spain, but the majority of the output comes from the Provinces of Jaen and Murcia, in the southern part. Jaen produced 70,220 metric tons out of the total of 136,180 tons for the country; Murcia's output was 33,625 tons. Lead production for 1919 decreased greatly as compared with 1918. Eight smelters refined 101,544 tons of lead in 1919, the largest factory, located in Cordoba, producing 45 per cent. of this amount. The refining and exportation from Huelva of 14,955 tons of lead ingots in 1920 is to be noted, as there was no export of lead in this form in 1919.

The 1919 production of silver-bearing lead was 41,875 tons—almost all from the 10 mines located in the Province of Cordoba, although a number of small mines are worked in the Province of Almeria. The year 1919 was the rejuvenation of this branch of the mining industry, which had fallen to a low figure in 1918.

There is only one silver mine in Spain, located in the Province of Guadalajara. Its 1919 output decreased greatly from 1918, but was not far below the normal for the decade, being 77 tons of ore, from which about one ton of silver was refined in the smelters of the same company. The total amount of silver refined in Spain in 1919 was 83 tons, all save one of which was produced by the process of separation from the silver-bearing lead ore, in the same refineries which smelt the

[1] *Metal. Bull.*, Mar. 24, 1922.
[2] *Mining Mag.*, Aug., 1921.

lead itself. While the total production for 1920 is not yet known, the total export of refined lead from Spain in that year was 88,121 tons, about 40 per cent. of which went to Great Britain, and the total export of silver-bearing lead ore was 18,689 tons, 80 per cent. of which went to Great Britain.

The 12 Spanish lead refineries in operation in 1919 turned out 125,721 tons of lead, valued at 68,907,963 pesetas at the refineries. These figures include the output of the four argentiferous lead refineries at Murcia, whose production amounted to 24,177 tons. The total production in 1919 fell 43,988 tons short of the 1918 production, and represents a decrease in value of production amounting to 40,700,849 pesetas. The principal refineries are located in the Provinces of Cordoba, Murcia, and Jaen.[1]

In an article on the Spanish lead industry, published in the *Revista Minera*, strong objections are raised to the proposed new export duties, which have been fixed at 30 pesetas (gold) for lead ore, 40 pesetas for silver-lead ore, and 50 pesetas for bar lead. The writer states that lead mining, contrary to the general opinion, is to-day far from being a paying industry, and that the large majority of the Spanish mines—in fact all except three—are in such an unsatisfactory position as regards the amount of metal produced that they have continually to make adjustments in order to cover their costs. In support of this statement reference is made to official statistics, according to which the production of lead in Spain up to the year 1913 amounted to 200,000 tons per annum. Since then the returns show a steady decrease, the figures for 1920 being only 100,000 tons, while the estimate for 1921 is no higher than 60,000 tons. It is held that such a falling-off during years both of war and of peace cannot be attributed to any cause other than that the industry is no longer remunerative and offers no inducement to development. Some mines have already closed down, and others are working at a loss in hope that the present industrial depression is only transitory. Only a very small proportion of the Spanish production can be consumed in Spain, and the industry is dependent on the export trade. If the present position is to be aggravated by the imposition of crushing duties in addition to those already levied, Spain will be unable to compete with the other producing countries. Persistence with the proposed new tariff will therefore, in the opinion of the writer, lead to the shutting-down of all the mines and smelting works with the exception of the three undertakings alluded to previously, and will have disastrous effects on all the other industries dependent on them.[2]

[1] *Suppl. to Comm. Rept.*, 1922.
[2] *Min. Jour.*, Sept. 3, 1921.

SPANISH EXPORTS[1]

Silver Lead

To	1917.	1918.	1919.
Belgium	.....	.....	300
France	464	227	3,319
Great Britain	20,239	14,937	17,678
Holland	.....	.....	.....
Other countries	715	1,198	.....
Total	21,418	16,362	21,297

Soft Lead

To	1917.	1918.	1919.
Belgium	.....	.....	14,420
France	46,649	39,858	48,381
Great Britain	44,845	34,792	16,377
Holland	926	.....	1,959
Italy	27,036	47,180	3,705
Portugal	1,253	3,166	638
Other countries	12,751	2,415	1,960
Total	133,460	127,411	87,404

[1] *Metal Bull.*

Tunis.—The majority of the lead ore of Tunis is treated in the Megrine works in Tunis itself, so that exports of ore represent much less than the production. In 1921 the exports amounted to 5997 metric tons, while the production was probably as much as 25,000 tons. Metallic lead to the amount of 8739 tons was exported to France and 6445 tons to Spain in 1921. Nearly all of the ore also was sent to France and Spain.

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